

EDITORIAL COMMENT

Assessing Mature Technology

What Is the Effect of High-Quality Risk Stratification Evidence With Exercise Echocardiography and Single-Photon Emission Computed Tomography Imaging?*

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In this issue of the *Journal*, Metz et al. (1) provide a systematic review on the prognostic value of exercise myocardial perfusion imaging (MPI) and echocardiography (Echo). In the field of cardiac imaging there has been a shift from reports on its diagnostic accuracy toward risk stratification. These results reveal that conventional stress cardiac imaging, accounting for more than 9 million procedures performed annually, has an exceptionally high negative predictive value (2). Clinical differences between Echo and MPI would not be detectable given annual rates of ischemic death or myocardial infarction of ~0.5%. This “warranty period” provides tremendous reassurance to patients and serves as supportive evidence for a “watchful waiting” approach to downstream patient management (3).

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This strong evidence base for Echo and MPI is put forth in an era where growth in medical imaging has come under intense scrutiny (4,5). Territorial conflicts between imaging specialists (i.e., radiologists and cardiologists) have focused on the tremendous growth in cardiac imaging as driving excessive health care costs. Several reports by Levin et al. (4,5) have described “unwarranted” use of cardiovascular imaging by cardiologists compared with radiologists. In a report using 1998 Medicare beneficiary files, they found that Echo accounted for 63% of all cardiovascular imaging and

was largely performed by cardiologists (4). Similarly, utilization rates for MPI grew 36% for cardiologists versus 4% for radiologists ($p < 0.001$) (5). Many have ascribed the growth in cardiac imaging to favorable procedural reimbursement but mostly as a consequence of self-referral by cardiologists.

Technology assessments from the American College of Radiology (ACR) and American College of Cardiology (ACC) as well as others have become integral methods for payers to focus acceptable utilization (6). The ACR has for years developed easy-to-use appropriateness criteria relying on expert opinion to guide indications for use of MPI and other imaging techniques (6). By comparison, the ACC has largely devised clinical guidelines and expert consensus statements for evidence synthesis, although appropriateness criteria for MPI were recently published (7). Although one can argue the benefit of developing criteria based on expert opinion versus meta-analytic approaches, the report by Metz et al. (1) highlights the large and diverse prognostic evidence supporting the effectiveness of exercise Echo and MPI with publications including 11,029 patients. Similar evidence is available from international cohorts, multicenter registries, and many prospective series focusing on the prognostic value of Echo and MPI (8–13). Technology without high-quality evidence may be left behind in reimbursement schemes that reward excellence (e.g., pay for performance).

However, what lies behind this discussion on imaging utilization is how to define acceptable growth for a given procedure. One critical piece of information may be derived from population statistics noting a growing denominator of imaging candidates. Expanding population subsets include those with a new coronary heart disease (CHD) diagnosis or elevated pretest risk. From 1979 to 2003, the number of patients discharged with a new CHD diagnosis increased by 16% (14). Similarly, the number of stroke survivors increased from 1.5 to 2.4 million (15), and within the last decade the prevalence of diabetes increased by 61% and the incidence of end-stage renal disease nearly doubled (14,16).

The growth in cardiac imaging may also be related to temporal changes in CHD mortality. An analysis of data from the Framingham Heart Study from 1950 to 1999 revealed that CHD death rates declined by 59% (17). Is it reasonable to infer that CHD mortality reductions are partially related to greater use of diagnostic tests (18)? Recent statements from the National Institutes of Health correlate reductions in CHD deaths to more intensive lipid-lowering guidelines (18–22). Using this logic, growth in high-quality cardiac imaging may contribute to declines in CHD mortality. The Metz et al. (1) data on cardiovascular event-free survival following Echo and MPI reflects commonplace management of patients with low- to high-risk imaging findings. Imaging is a core element of stable chest pain management and an effective gatekeeper to coronary revascularization resulting in improved outcomes. The pub-

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lished evidence put forth by Metz et al. (1) provides one link in a reasonable chain of logic that the use of cardiac imaging improves outcome.

Certainly, self-referral cannot be eliminated as a factor escalating cardiac imaging use. However, a growing at-risk population and the clinical value of documenting ischemia for therapeutic decision making cannot be eliminated as causative. Recently introduced health care policy initiatives focus on restricting testing, such as Echo and MPI, to imaging specialists. The meta-analysis published by Metz et al. (1) highlights the high-quality evidence base for Echo and MPI largely developed within the cardiovascular community. Although earlier studies report differential prognostic findings for Echo and MPI (23–27), as larger sample sizes were accrued we have observed a convergence of outcome evidence. The low event rate in patients with normal exercise Echo and MPI supports similar post-test management strategies for patients with low-risk findings. Evidence contained within this meta-analysis should curtail any further commentary on differences between the modalities. Given the definition (6) that “an appropriate imaging study is one in which the expected incremental information . . . exceeds the expected negative consequences by a sufficiently wide margin,” it is clear from this report by Metz et al. (1) that dramatic growth in the field of cardiac imaging is supported by a robust and mature evidence base noting a high negative predictive accuracy for exercise Echo and MPI.

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